

ENERGY STAR® Office, Bank/Financial Institution, and Courthouse Energy Performance Scale Development

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<u>Presentation, Updates to the EPA Rating for Office Space (Nov 8, 2006)</u>	(pg#?)
A presentation given in advance of the 2010 release of updates to energy performance scales for several building types. After briefly explaining what an energy performance scale is, the need for updates is explained; Reasons for updating models include the availability of more informative recent survey data, incorporating different characteristics into regression models or examining alternative statistical methods for modeling. The possible changes to building scores resulting from the model updates and the analysis to determine the extent of these changes is also discussed. The date of some releases including updates is given and the presentation concludes by requesting feedback from interested parties	
<u>Model Revision Phase 1, Direction for SRA (June 14, 2007)</u>	(pg#?)
A report describes the desired updates to PM that EPA would like SRA's PM development activities to focus on. Based on the specified technical changes to each model, corresponding changes are described for the PM terminology, definitions, help section, question prompts, etc. Further information about new source conversion factors, detailed calculation instructions, and other changes are described as well. A request was also included for SRA to compute the old and new scores for a future assessment of score changes resulting from the updates and a template for summarizing this information is provided. At the bottom of the report, there is a separate section devoted to answering questions posed by SRA during the development process which includes the template for summarizing the old and new scores requested.	
<u>Analysis of Overall Rating Changes, Sept. 2007</u>	(pg#?)
A report summarizing the score changes caused by updates to Portfolio Manager model updates, including the Office model. The new Office model now applies to 3 total building types (Offices, Banks/Financial Institution and Courthouse) and is based on 2003 CBECS data as opposed to the 1999 CBECS data used initially. In addition to the significant changes to the Office model, updates for other models are reported as well. These changes to other models would include new source energy conversion factors and weather adjustments for models of all building types. The magnitude of the impacts of these changes on all buildings' scores was examined and the results were displayed in tables throughout the document. A table summarizing the extent of impacts on building scores is presented on page 2, showing the total number of buildings of each type effected, the proportion that experienced a change in score of less than 5 points, etc.	
<u>Detailed Analysis of Office & Data Center Changes Associated with 2010 Portfolio Manager Release</u>	(pg#?)
A memo regarding the effects of the updates on existing buildings' scores. It describes impacts resulting from the updates in more detail on changes to the Offices and Data Centers energy performance scales than the report titled "Analysis of Overall Rating Changes". The average score changes are examined for all buildings of any type according to size in increments of 200,000. A table summarizing average change by size found that the average change in score is progressively larger as size increases. For instance, the average score change is +1 for buildings from 0 to 200,000 square feet, -2 for buildings between 400,001 to 600,00 square feet and -5 for buildings between 800,001 to 1,000,000 square feet. Various other problems are also discussed, such as the misclassification of spaces within many office buildings as data center spaces, causing a higher proportion of total offices to receive high scores. The unusually large proportion of highly scoring offices may be explained by simple mistakes, such as double counting the same computers as servers in data centers and PCs in office spaces. Descriptive statistics for the total size and operational hours of existing buildings classified as data centers were used to estimate the number of offices misclassified as data centers. It was found that 660 buildings currently classified as data centers were either less than 200 square feet or operated less than 144 hours a week, both of which indicate misclassification. These average changes in score resulting from correct classification were discussed.	

Adjustments of Ratings Models to Account for Extreme Values (Nov 23, 2009)(pg#?)

A report assessing the sensitivity of models to extreme values for characteristics used. The bias of models towards large buildings was examined, specifically that models were giving disproportionately higher scores to buildings with extreme values for characteristics (higher worker or PC density, for instance). A solution proposed involved putting caps on values for each characteristic, above which a building would not get additional increase predicted EUI. The sensitivity analysis shows the extent to which buildings with large values distort the overall percentile ranking of the energy performance scale and how much improvement caps at different values offer. A final recommendation is given along with a timeline for further development before the model release date.

Office and Retail Model Adjustments, Direction for SRA (Dec 11, 2009)(pg#?)

A document explaining the adjustments required for Office and Retail models to correct for bias in favor of retail buildings with extremely high register density and office buildings with excessive indoor space or pc density. This document details how this bias was corrected by simply capping the values for these characteristics; the square footage adjustment for office buildings total indoor space would be capped at 200,000 square feet, beyond which no adjustments would be made to the building. The PC and register density at offices and retail stores would be capped as well at 11.1 and .71, respectively. The document also provided a timeline of implementing these changes before the public release of the updated models on April 2010.

Final Office Model Replication(pg#?)

A document that provides all information necessary to replicate the Office energy performance scale model. Among the information provided are descriptive statistics summarizing CBECS survey data for characteristics selected as variables in the statistical regression upon which the model is based. The filters applied to this survey data to form the dataset used in the regression are explained in detail. The model resulting from this regression and the development of the score lookup table are provided as well. The goodness-of-fit of this model is also discussed by providing descriptive statistics of how much variation is accounted for, such as the R^2 value and ANOVA tests.

Analysis of Expected Changes, June 2010 Portfolio Manager Release(pg#?)

An internal report assessing the overall score changes caused by updates to numerous energy performance scales, including Office, Bank/Financial Institution and Courthouses. Aggregate statistics measuring the changes to building scores are presented, such as average score change across all buildings, average score change by category, total number of buildings losing/gaining the ENERGY STAR, etc. The technical changes to each model (upon which the energy performance scales are based) is summarized for each type of building. Examples of these technical changes include the usage of more recent CBECS data and the alteration of indoor space limitations. An appendix with further statistics and relevant information is included.

Final Lookup Table(pg#?)

An excel file that was used to create the final lookup table. This spreadsheet contains all the information from CBECS data of 498 offices, banks/financial institutions and courthouses required to recreate the energy performance scale. All requisite variables for scoring each building are available such as seating density, heating degree days, pc density, hours of operation, etc. Also shown are the results of a weighted regression using all variables, with coefficients for each variable are shown. The predicted EUI and energy efficiency ratios for each building are then determined and used to create a table listing the score and percentile corresponding to each building also included.

ENERGY STAR® Performance Ratings Technical Methodology for Office, Bank/Financial Institution, and Courthouse(pg#?)

The final draft of the Technical Methodology for Office, Bank/Financial Institution and Courthouse energy performance scale. The document explains how this model was developed and how the score based upon it can be systematically applied to any eligible building. This document is publicly available on the website and walks readers through each aspect of development. The explanation provided proceeds in an orderly manner, beginning with the reference data for hospitality facilities from the CBECS survey, the characteristics/variables selected from the survey, the filters applied to those variables, the statistical regression of the final dataset, the development of coefficients from the results of this regression, the predicted EUI formula upon which the model is based on and, finally, an example calculation. This example calculation walks readers through utilization of the model by calculating a predicted EUI based on the example facility's data, calculating actual EUI and assigning a score based on the energy efficiency ratio of the actual EUI over the predicted EUI. The final score lookup table is also given at the end of the document.

Note: The file names for the documents in the shared folder on the G drive are different than the titles listed above. The list below shows which file names correspond to which title above:

Title in Table of Contents	File Name on Shared Drive
Presentation, Updates to the EPA Rating for Office Space	20061108_Offices
Model Revision Phase 1, Direction for SRA	PI_Direction_Updated_20070614
Analysis of Overall Rating Changes	2007_September Aggregate_Changes
Detailed Analysis of Office & Data Center Changes Associated with 2010 Portfolio Manager Release	Detailed Analysis for CRE 20100614
Adjustments of Ratings Models to Account for Extreme Values	Model Sensitivity_20091123
Office and Retail Model Adjustments, Direction for SRA	Direction_Office and Retail_20091211
Final Office Model Replication	Office_Model_Final
Analysis of Expected Changes, June 2010 Portfolio Manager Release	Overall Summary for Branch 2010604_Final
Final Lookup Table	Final_Lookup_498
ENERGY STAR® Performance Ratings Technical Methodology for Office, Bank/Financial Institution, and Courthouse	Office_TD_20100607_posted

Shared Folder Location:

G:\CPPD\C&I Branch\C&I Tools Team\ENERGY STAR Scale – Referenc\Office